CLAIMS:

1. A process for the manufacture of ethylene oxide through the epoxidation of ethylene in a reactor having at least one inlet for the introduction of raw materials and additives and at least one outlet for the discharge of ethylene oxide, which process comprises:

A) reacting a feed comprising ethylene, oxygen, and optionally ethane in the presence of a catalyst, said catalyst comprising a catalytically-effective amount of silver on an inert, refractory solid support and at least one efficiency-enhancing salt of a member of a redox-half reaction pair;

B) adding to said feed a two-component gas-phase promoter comprising at least one chlorine-containing component selected from a group consisting of ethyl chloride, methyl chloride, vinyl chloride and ethylene dichloride; and at least one nitrogen-containing component selected from a group consisting of nitric oxide and other compounds capable of forming under reaction conditions at least one gaseous efficiency-enhancing member of a redox-half reaction pair comprising NO, NO_2, N_2O_3 or N_2O_4;

C) adjusting the amount of each component of said gas-phase promoter to maintain the ratio of N* to Z* equal to or less than 1 wherein, N* is defined as the nitric oxide equivalent, in units of ppmv, having an numerical value from 1 to 20 ppmv and

$$Z^* = \frac{\text{ethyl chloride equivalent (ppmv) x 100 percent}}{\text{ethane equivalent (mol percent) x 100}}$$

having an numerical value of 5 to 40 ppmv; and

D) controlling the temperature of said reactor from 200°C. to 300°C., and the pressure at the inlet of said reactor from 1000 to 2500 kPa (absolute), and the concentration of carbon dioxide at said inlet from 0 to 2 mole percent.

2. The process of claim 1 wherein said efficiency-enhancing salt is potassium nitrate or rubidium nitrate.

3. The process of claim 1 wherein said silver is present from 5 to 50 percent by weight of the catalyst.

4. The process of claim 1 wherein said refractory solid support comprises alpha-alumina.

5. The process of claim 4 wherein said alpha-alumina support has a morphology comprising interlocking platelets.

6. The process of claim 1 wherein the temperature of said reactor is controlled from 210°C. to 280°C.

7. The process of claim 1 wherein the pressure at the inlet of said reactor is controlled from 1800 to 2500 kPa (absolute).

5